

Outcomes of Patients with Morbidly Adherent Placenta in Ain Shams Maternity Hospital: a Retrospective Study

Amr Hassan El-Shalakany , Amr Abdel Aziz Elsayied , Ahmed Mohammed Ragab

*Department of Obstetrics and Gynecology, Faculty of Medicine Ain Shams University

Corresponding author: Ahmed Mohammed Ragab, bodyatef07.ba@gmail.com

ABSTRACT

Background: morbidly adherent placenta is defined as an abnormal adherence of all or part of the placenta to the underlying uterine wall. **Aim of the work:** this study aimed to evaluate the management of morbidly adherent placenta in Ain Shams Maternity Hospital during the 5-year period from January 2012 to December 2016. **Study Design:** this is a retrospective study. **Study Setting:** Ain Shams University Maternity Hospital.

Patients and Methods: records of hospital admissions during the planned time frame with the diagnosis of antepartum hemorrhage or placenta accreta/increta/percreta were reviewed.

Results: Ain Shams University Maternity Hospital (ASUMH) is a major tertiary referral hospital in Egypt. In evaluation of the management and short term maternal and perinatal outcomes of morbidly adherent placenta offered to women at ASUMH, the hospital archives were examined for hospital records fulfilling the criteria of this study population during the 5-year period from January 2012 to December 2016. During the 5-year period of the current study, there were 58,529 deliveries; 29,282 cases; they were delivered by CS (50.03%). MAP was diagnosed in 429 cases 0.7 % of total deliveries with an incidence of 1 in 136, 1.5% of total CS. These results indicated a high incidence of MAP, as a result of high rates of CS.

Conclusion: morbidly adherent placenta was highly associated with the existence of placenta previa, especially in cases with previous cesarean section. When morbidly adherent placenta was diagnosed or suspected antenatally, the patient must be referred to a tertiary center. Generally, the recommended management is cesarean hysterectomy. However, this approach might not be considered first-line treatment for women who have a strong desire for future fertility. Therefore surgical management of morbidly adherent placenta may be individualized.

Keywords: morbidly adherent placenta – *in vitro* fertilization - alpha feto protein.

INTRODUCTION

The morbidly adherent placenta is now a significant obstetric challenge. Morbidly adherent placenta is often used as a general term, but it is defined by the levels of invasion of chorionic villi into maternal myometrium. Once a rare diagnosis, it is now the leading cause of postpartum hemorrhage and indication for a gravid hysterectomy. Traditionally, abnormal placentation has been classified into accreta, increta and percreta based on the depth of myometrial invasion: superficial, deep, and through the uterine serosa respectively and the greater the invasion, the greater the risks for hemorrhage and maternal morbidity⁽¹⁾.

The basic histopathological disorder lies on the absence of both the decidua basalis and the Nitabuch's layer, which result in a direct attachment of the chorionic villi to the myometrium. The most severe manifestations of this process result in placenta increta when chorionic villi invade into myometrium and placenta percreta when chorionic villi invade to or through the uterine serosa^(2, 3). About 75% of morbidly adherent placentas are

morbidly adherent placenta's 18% were placenta incretas and 7% were placenta percretas. Morbidly adherent placenta can be subdivided into total morbidly adherent placenta, partial morbidly adherent placenta and focal morbidly adherent placenta based upon the amount of placental tissue involved in their attachment to the myometrium⁽⁴⁾.

The incidence of morbidly adherent placenta has been steadily increasing specially during the last two decades, mirroring increased rates of caesarean section⁽⁵⁾. The incidence varies from 1 in 533 to 1 in 2500⁽⁶⁻⁸⁾.

In the event of morbidly adherent placenta, the third stage of labor may be complicated by severe uterine hemorrhage that may lead to the need of extensive life-saving surgical interventions such as hysterectomy and ligation of major pelvic vessels. The average blood loss volume at delivery was 3,000-5,000 ml⁽⁹⁾. As a consequence of placental invasion to adjacent organs, reconstruction of the urinary bladder or bowel may be necessary. Massive blood and blood products transfusions were the rule in these dramatic cases, and maternal morbidity is

high. Other complications included neonatal death, infection, fistula formation and ureteral damage. A maternal mortality rate of 7% has been quoted previously for this condition^(8, 10, 11).

The major risk factor was placenta previa with a previous cesarean section, but other predisposing factors have been identified including: scarred uterus, multiparity, previous uterine surgery, advanced maternal age, previous uterine curettage, uterine closure with continuous suture after cesarean section and Asherman syndrome^(3, 6, 12, 13, 14). Furthermore, female fetus gender was also reported more frequently than males in association with morbidly adherent placenta⁽¹⁵⁾.

Antenatal diagnosis is a key factor in optimizing the maternal and neonatal outcome. Morbidly adherent placenta was diagnosed ideally in the antenatal period by either sonographic or magnetic resonance imaging techniques. Several studies have demonstrated the usefulness of ultrasonography in making this diagnosis, particularly at > 20 weeks' gestation^(16, 17). Unfortunately, some cases of morbidly adherent placenta are diagnosed at the time of delivery when the mother experiences continued vaginal bleeding, or heavy vaginal bleeding when an attempt is made to remove the placenta or only part of the placenta is able to be removed⁽¹⁸⁾.

There is debate over the ideal therapeutic approach for management of Morbidly adherent placenta. The generally held opinion is that the morbidly adherent placenta should be treated by caesarean hysterectomy, without attempts at removal of the placenta⁽¹⁸⁾. Conservative management, whereby the placenta is left within the uterus, it is advocated by some investigators who cited that this approach has the benefits of preservation of fertility, prevention of massive hemorrhage and protection against damage to adjacent organs⁽¹⁹⁾. This conservative approach, however, is not without risks, which included significant bleeding, infection, fistula formation and failure of placental resorption⁽²⁰⁾.

PATIENTS AND METHODS

Study Population

Subjects admitted to the Delivery Unit diagnosed with morbidly adherent placenta, in 5-year period from January 2012 to December 2016.

Study Interventions:

Records of hospital admissions during the planned time frame with the diagnosis of antepartum

haemorrhage or placenta accreta/increta/percreta were reviewed.

The following data were gathered (whenever available), tabulated and subjected to the proper statistical analysis:

Administrative data

- Hospital number
- Date and time of admission
- Date of discharge
- Name (for the record identification list only)

History

- Age
- Duration of marriage
- Gestational age (by menstrual dates or US)
- Obstetric history (parity and mode of delivery)

- Present and past history of any medical, surgical or obstetric problems; history of infection after previous CS.

General examination

- General condition
- Vital data

Abdominal examination

- Fundal level
- Estimated fetal weight (clinically or by US)

Investigations performed

- CBC
- Ultrasonography and placental bed Doppler US
- MRI (if available)

Intrapartum management

- Intrapartum complications; hysterectomy, complications during surgical intervention if any (e.g. bladder or bowel injury)

Postpartum Data

- Postpartum haemorrhage
- Blood transfusion
- ICU admission
- Neonatal outcome, NICU admission, mortality
-

STUDY OUTCOMES

Primary Outcome

Maternal outcome; whether caesarean hysterectomy was done or not.

Secondary Outcomes

Maternal complications

- Blood transfusion
- Surgical injuries (bowel or bladder injury)
- Postpartum endometritis
- ICU admission
- Hospital stay
- Mortality

▪ **Perinatal outcomes:**

- Apgar score
- NICU admission
- Respiratory morbidity, e.g. transient tachypnoea of the newborn

○ **Morality**

The study was approved by the Ethics Board of Ain Shams University.

RESULTS

Evaluation of the management and short term maternal and perinatal outcomes of morbidly adherent placenta offered to women at ASUMH, the hospital archives were examined for hospital records fulfilling the criteria of the study population during the 5-year period from January 2012 to December 2016. Data are summarized in **table 1**.

Table 1: statistics of reviewed data for the studied period at Ain Shams University Maternity Hospital

	N	%
Total deliveries	58,529	
Total vaginal deliveries	29,247	49.97% of total deliveries
Total caesarean sections	29,282	50.03% of total deliveries
Morbidly adherent placenta:		0.7% of total deliveries
• Placenta accreta	429	1.5% of total CS
• Placenta increta	348	81.1% of MAP
• Placenta percreta	45	10.5% of MAP
	36	8.4% of MAP
Managed by hysterectomy	201	0.7% of total CS 46.8% of MAP
Managed conservatively	228	0.8% of total CS 53.2% of MAP

Table 2 provided the details of antenatal findings and intra-/post-operative complications of the studied population according to outcome, whether hysterectomy or uterine conservation.

Placental localization was highly correlated with the outcome, where 50.6% of cases with anterior placenta (166 of 328 cases) and 96% of placenta was completely covering the internal os (25 of 26 cases) underwent cesarean hysterectomy. However, 86.6% of posterior located placenta were underwent successful conservation (65 of 75 cases).

Patients showed US findings suggestive of invasion were 37 times more likely to undergo cesarean hysterectomy (OR 37; 95% CI 2.2–

624.3; $p=0.012$). MRI grading of myometrial invasion was also highly correlated with cesarean hysterectomy.

Although there was no statistically significant difference between both outcomes regarding pre-operative hemoglobin and hematocrit patients who underwent cesarean hysterectomy had significantly lower post-operative hemoglobin and hematocrit, with longer operating time and more blood loss.

Complications were more common in the hysterectomy group, the most significant being bladder injury, surgical site infection and post-operative ICU admission, thus longer hospital stay. There was one case of maternal mortality that had DIC after massive blood loss.

Table 2: comparison between caesarean hysterectomy and uterine conservation groups regarding different pre-operative findings and post-operative complications

	CS hysterectomy N=201(%) (mean±SD)	Conservative N=228 (%) (mean±SD)	p-value
Imaging findings			
Ultrasonography			
Placental localisation			
• Anterior	166 (82.59%)	62 (71.05%)	<0.0001 ^b
• Posterior	10 (4.98%)	65 (28.51%)	
• Centralis complete	25 (12.44%)	1 (0.44%)	
Signs of invasion			
– Not recorded	6 (2.99%)	50 (21.93%)	
– Yes	195 (97.01%)	63 (71.49%)	0.0122 ^d
– No	0	15 (6.58%)	
Retroplacental zone of cleavage			
– Not recorded	0	68 (29.82%)	<0.0001 ^b
– Lost	195 (97.01%)	49 (21.49%)	
– Partially lost	1 (0.5%)	94 (41.23%)	
– Normal	5 (2.49%)	17 (7.46%)	
Placental vasculature			
– Not done	7 (3.48%)	63 (27.63%)	<0.0001 ^b
– Increased	194 (96.52%)	21 (9.21%)	
– Normal	0	44 (63.16%)	
MRI			
– Not done	179 (89.05%)	19 (96.05%)	0.024 ^b
– Accreta	10 (4.98%)	8 (3.51%)	
– Increta	3 (1.49%)	0	
– Percreta	9 (4.48%)	0	
– Previa	0	1 (0.44%)	
Peri-operative data			
Pre-operative CBC			
• Pre-operative HGB	10.62±1.13	10.76±0.97	0.165 ^a
• Pre-operative HCT	32.14±3	32.17±2.62	0.908 ^a
Post-operative CBC			
• Post-operative HGB	8.56±1.35	9.06±1.33	<0.001 ^a
• Post-operative HCT	26.27±4.63	27.52±4.47	0.005 ^a
Duration of operation, hr	3.15±0.8	2.2±0.76	<0.001 ^a
Blood loss, mL	2708±1881	1452±1065	<0.001 ^a
Complications			
Visceral injuries			
• Bladder	54 (26.9%)	16 (7.0%)	<0.001 ^c
• Ureteric	12 (5.97%)	4 (1.75%)	0.087 ^c
• Intestinal	4 (2%)	1 (0.4%)	0.272 ^c
Vascular injuries			
• Uterine artery	10 (4.97%)	17 (7.46%)	0.389 ^c
• Internal iliac artery	3 (1.5%)	0	0.202 ^c

• Internal iliac vein	1 (0.5%)	0	0.946 ^c
• Common iliac artery	1 (0.5%)	0	0.946 ^c
DIC	10 (5%)	9 (3.9%)	0.465 ^c
SSI	23 (11.44%)	8 (3.51%)	0.0029^c
DVT	0	1 (0.4%)	0.946 ^c
Mortality	1 (0.5%)	0	0.946 ^c
ICU admission, days	2.17±2.43	1.44±0.8	0.027^a
total admission duration, days	6.65±4.49	4.29±3.59	<0.001 ^a

^a: independent *t*-test, ^b: χ^2 test, ^c: comparison of proportions, ^d: odds ratio

Table 3 compared between elective and emergent cases. There was a highly significant correlation between the urgency of delivery and abdominal incision were most of elective cases were operated upon through Pfannenstiel incision and most of emergent cases had a midline laparotomy.

There was a tendency towards the dissection of the bladder before hysterotomy and lower segment incision regardless the urgency of delivery. Although the placenta separated during CS in most of the cases in both groups, most elective cases had successful uterine conservation,

while most emergent cases had caesarean hysterectomy. Although, the placenta separated in most of the cases (36.9% of elective and 51% of emergent cases) most of these were manually removed, with spontaneous separation occurring only in 13 of 429 cases.

The internal iliac artery injury and most of uterine artery injury occurred in cases of emergency, while the injury of internal iliac vein and common iliac artery occurred in the elective cases. Coagulopathy occurred in 12.7% of emergent cases while in 6% of elective cases and that difference was statistically significant.

Table 3: comparison between elective and emergency interventions regarding different peri-operative data, technical variables and complications

	Elective (N=327), 76.2%	Emergency (N=102), 23.8%	p-value
Peri-operative data			
Pre-operative CBC			
• Pre-operative HGB	10.71±1.04	10.52±1.07	0.291 ^a
• Pre-operative HCT	32.19±2.8	31.73±2.8	0.396 ^a
Post-operative CBC			
• Post-operative HGB	8.79±1.35	9.19±1.41	0.087 ^a
• Post-operative HCT	26.78±4.57	28.56±4.48	0.022^a
Duration of operation, hr	2.65±0.91	2.62±0.9	0.83 ^a
Operative technique			
Skin incision			
• Midline	132 (40.4%)	59 (57.8%)	<0.001^b
• Pfannenstiel	195 (59.6%)	43 (42.2%)	
Dissection of bladder			
• After uterine incision	42 (12.8%)	30 (29.4%)	<0.001^b
• Before uterine incision	285 (87.15%)	72 (70.6%)	
Uterine incision			
• Lower segment	239 (73.1%)	58 (56.9%)	0.003^b
• Upper segment	88 (26.9%)	44 (43.1%)	
Deal with placenta			
• Failure of separation	118 (36.1%)	50 (49%)	0.026^b
• Separated	209 (63.9%)	52 (51%)	
– Manual removal	199 (60.9%)	49 (48%)	0.004^b
– Spontaneous separation	10 (3.1%)	3 (2.9%)	
Line of management			
• Conservation	190 (58.1%)	38 (37.2%)	<0.001^b
• Caesarean hysterectomy	137 (41.9%)	64 (62.7%)	
– Pre-planned CS hysterectomy	52/137 (38%)	18/64 (28.1%)	
– Failed conservation	85/137 (62%)	46/64 (71.9%)	
Blood loss, mL	2022±1629	2068±1531	0.877 ^a
Complications			
Visceral injuries			
• Bladder	57 (17.4%)	13 (12.7%)	0.333 ^c
• Ureteric	13 (4%)	3 (2.9%)	0.832 ^c
• Intestinal	5 (1.5%)	0 (0%)	0.477 ^c
Vascular injuries			
• Uterine artery	9 (2.8%)	18 (17.6%)	<0.001^c
• Internal iliac artery	0	3 (2.9%)	0.016^c
• Internal iliac vein	1 (0.3%)	0	0.526 ^c
• Common iliac artery	1 (0.3%)	0	0.526 ^c
DIC	6 (1.8%)	13 (12.7%)	<0.001^c
SSI	26 (7.95%)	5 (4.9%)	0.412 ^c
DVT	1 (0.3%)	0	0.526 ^c
Mortality	1 (0.3%)	0	0.526 ^c
ICU admission, days	1.62±1.5	1.23±0.44	0.355 ^a

^a: independent *t*-test, ^b: χ^2 test, ^c: comparison of proportions

Table 4 showed statistically significant difference between LSCS and USCS according to management, dissection of bladder, U. bladder, uterine artery and DIC.

Table 4: comparison between LSCS and USCS regarding operative technique and complications

	SCS (N=297), 69.2%	USCS (N=132), 30.8%	p-value
Line of management			
• Conservation	189 (66.6%)	39 (29.5%)	<0.0001^b
• Caesarean hysterectomy	108 (36.4%)	93 (70.5%)	
Dissection of bladder			
• After uterine incision	33 (11.11%)	39 (29.54%)	<0.0001^b
• Before uterine incision	264 (88.89%)	93 (70.45%)	
Visceral injuries			
• Bladder	59 (19.9%)	11 (8.33%)	0.004^c
• Ureteric	11 (3.7%)	5 (3.8%)	0.86 ^c
• Intestinal	5 (1.68%)	0	0.315 ^c
Vascular injuries			
• Uterine artery	27 (9.1%)	0	<0.001^c
• Internal iliac artery	3 (1.01%)	0	0.595 ^c
• Internal iliac vein	1 (0.3%)	0	0.604 ^c
• Common iliac artery	1 (0.3%)	0	0.604 ^c
DIC	7 (2.4%)	12 (9.1%)	0.017^c
SSI	17 (5.7%)	14 (10.6%)	0.108 ^c
DVT	1 (0.3%)	0	0.604 ^c
Mortality	1 (0.3%)	0	0.604 ^c

^b: χ^2 test, ^c: comparison of proportions

*p-value <0.05 significant; **p-value <0.001 highly significant

Table 5 summarised the perinatal outcomes. There were 438 neonates corresponding to 429 pregnancies, with 9 twin pregnancies. Most of the cases (80.2%) were uncomplicated. The 98 cases of NICU admission include 29 infants of diabetic mothers, 25 with 5-minute Apgar score <5, 2 neonatal sepsis (intrauterine infection), and the remaining 42 were due to prematurity.

Table 5: comparison between LSCS and USCS regarding operative technique and complications

	N=438 (Mean±SD)	% (range)
5-minute Apgar score	6±2	(3-9)
5-minute Apgar score<7	27	6.2%
Birth weight, kg	2.93±0.76	(1.5-4.2)
NICU admission	98	22.4%
Healthy neonate	351	80.2%
IUFD	54	12.3%
Neonatal mortality	33	7.5%

DISCUSSION

The purpose of this retrospective study which was conducted at Ain Shams University Maternity Hospital during the period from January 2012 to December 2016, was to determine the incidence, risk factors, and outcomes of management of patients with morbidly adherent placenta.

Although placenta accreta was considered a fairly rare event, its annual incidence appears to be on the increase. In 1994, the incidence of placenta accreta for the previous 10 years was reported to be 1 in 2510 cases, whereas a study reported an incidence of 1 in 533 cases for the previous 20 years⁽²¹⁾ and the incidence in 2006 was 1 in 210 cases⁽²²⁾. This alarming increase appears to be directly related to the rising rates of CS, which is a major risk factor for placenta accreta.

During 5-years period of the current study, there were 58,529 deliveries; 29,282 cases were delivered by CS (50.03%). MAP was diagnosed in 429 cases (0.7 % of total deliveries with an incidence of 1 in 136, 1.5% of total CS). These results indicated a high incidence of MAP, as a result of high rates of CS.

Although there was no statistically significant difference between both outcomes (conservation and hysterectomy) regarding pre-operative hemoglobin and hematocrit, patients who underwent caesarean hysterectomy had significantly lower post-operative hemoglobin and hematocrit. With longer operating time (the mean of operative time in patients who had CS hysterectomy were 3.15 ± 0.8 , while, 2.2 ± 0.76 in patients who had conservative management) and more blood loss (the mean of blood loss in patients who had CS hysterectomy were $2708 \text{ ml} \pm 1881$, while 1452 ± 1065 in patients who had conservative management).

Complications were more common in the hysterectomy group, as in the current study 11.44%, of cases were complicated by SSI. **Eller et al.**⁽²³⁾ reported a similar rate of 11.8% with no statistically significant difference between both studies ($p < 0.259$).

The most significant being bladder injury [54/201 (26.9%) in patients who had CS hysterectomy, while, 16 (7.0%) in patients who had conservative management], and post-operative ICU admission (the mean of ICU admission duration (days) of patients who had CS hysterectomy were 2.17 ± 2.43 , while, 1.44 ± 0.8 in patients who had conservative management), thus longer hospital

stay (the mean of duration (days) of hospital stay in patient who had CS hysterectomy were 6.65 ± 4.49 , while, 4.29 ± 3.59 in patients who had conservative management).

There was one CS hysterectomy case of maternal mortality (0.5%) that had DIC after massive blood loss⁽²⁴⁾.

The choice of skin and uterine incision needed to avoid the placenta was depended on the location of the placenta. A low transverse skin incision allows access to the lower half of the uterus and is reasonable if the upper margin of the anterior aspect of the placenta does not rise into the upper segment of the uterus. If, however, the placenta is anterior and extending towards the level of the umbilicus, a midline skin incision may be needed to allow for a high upper-segment longitudinal uterine incision. It is therefore useful for the surgeon to perform an ultrasound scan before surgery to plot out the extent of placenta before starting. This was surgical logic and not evidence based⁽²⁴⁾.

Most of elective cases (59.6%) were operated upon through Pfannenstiel incision, while 57.8% of emergent cases had a midline laparotomy.

Regardless the urgency of delivery, dissection of the bladder was done before uterine incision in 87.15% of elective cases and 70.6% of emergent cases. It must be noted that one of the limitation of this study was that it could not conclude the effect of dissection of bladder either before or after uterine incision on the outcome as regard occurrence of urological complications in the study subjects of this study. There was a statistically significant tendency to do Pfannenstiel skin incision and lower segment hysterotomy regardless the urgency of delivery.

In the current study, the placenta separated during CS in most of the cases in both groups 63.9% in elective cases and 51% in emergent cases, accordingly, most elective cases (58.1%) had successful uterine conservation, while most emergent cases (62.7%) had caesarean hysterectomy. **Kong et al.**⁽²⁵⁾ studied a comparison between 29 elective and 18 emergent CS of 47 cases with MAP in China in the period from 2011 to 2014. Their study concluded that placenta separated during CS in most of the cases in both groups 68.9% in elective cases and 77.7% in emergent cases, accordingly, most of (58.2%) elective and (66.6%) of emergent cases had successful uterine conservation. the difference between the outcomes

of both studies (conservation V.S hysterectomy in elective or emergent cases) could be explained by the great difference between the demographic characteristics between the study population, high order parity rather high order section been quite low in the Chinese population due to local national legislation.

In the current study, upon comparison between 327 elective and 102 emergent cases, there was a highly significant difference between both groups regarding post-operative hematocrit, being lower in elective cases. The association of marginally greater mean blood loss with emergency cases would imply more aggressive intra-operative replacement, thus a greater post-operative hematocrit. The results of **Kong *et al.***⁽²⁵⁾ are in agreement with our study regarding the greater amount of blood loss in emergent cases.

There was no internal iliac artery injury in elective cases, while there was 2.9% in emergency cases and most of uterine artery injury showed 2.8% in the elective cases and 17.6% in emergent cases occurred in cases of emergency, while the injury of internal iliac vein was 0.3% and common iliac artery was 0.3% which occurred in the elective cases. Coagulopathy (DIC) occurred in 12.7% of emergent cases, while it was 6% of elective cases and that difference was statistically significant.

Kong *et al.*⁽²⁵⁾ reported that although the rate of cesarean hysterectomy in the 2 groups was similar, incidence of maternal complications such as EBL, transfusion volume of PRBCs, fresh frozen plasma, and maternal ICU admission in emergency CS group was higher than in scheduled CS group. These data are supported by findings of the current study.

In the present study, the mean gestational age at delivery was 35.87 ± 2.2 weeks of gestation. The mean birth weight (kg) was 2.93 ± 0.76 , the healthy neonate were 80.1%, 1.8% IUFD, 6.2% Apgar score at 5 minutes<7, 22.4% NICU admission and 7.5% Neonatal mortality. In comparable with a retrospective study done by **Ascioglu *et al.***⁽²⁶⁾ at two tertiary hospitals in Istanbul to investigate patient characteristics and fetal and maternal outcomes of placenta praevia and accreta in the 5-year period from 2005 to 2010. The perinatal outcomes for 46 patients who had placenta accreta were as following: the mean gestational age at delivery was 35.4 ± 4.4 weeks' gestation, The mean birth weight (kg) was 2.8 ± 8.1 , 8.7% Apgar score at 5 minutes<7, 19.5% NICU admission and 4.3%

neonatal mortality. There was no statistically significant between the perinatal outcomes of both studies.

CONCLUSION

Morbidly adherent placenta was highly associated with the existence of placenta previa, especially in cases with previous cesarean section. When morbidly adherent placenta is diagnosed or suspected antenatally, the patient must be referred to a tertiary center. Generally, the recommended management is cesarean hysterectomy. However, this approach might not be considered first-line treatment for women who have a strong desire for future fertility. Therefore surgical management of morbidly adherent placenta may be individualized.

REFERENCES

1. **Goh WA and Zalud I (2016):** Placenta accreta: diagnosis, management and the molecular biology of the morbidly adherent placenta: *J. Matern. Fetal Neonatal. Med.*, 29(11): 1795-800.
2. **Garmi G and Salim R (2012):** Epidemiology, etiology, diagnosis, and management of placenta accrete. *Obstetrics and Gynecology International*, 2012: 873-878.
3. **Pinto PF, Machado AP and Montenegro NA (2016):** Risk of hemorrhage in abnormally invasive placenta according to its management. *J. Matern. Fetal Neonatal Med.*, 27: 1-24.
4. **Wehrum MJ, Buhimschi IA and Salafia C (2011):** Accreta complicating complete placenta previa is characterized by reduced systemic levels of vascular endothelial growth factor and by epithelial-to-mesenchymal transition of the invasive trophoblast. *Am. J. Obst. Gynecol.*, 204(5): 411-418.
5. **Miller ES, Linn RL and Ernst LM (2016):** Does the presence of placental basal plate myometrial fibres increase the risk of subsequent morbidly adherent placenta: a case-control study. *BJOG.*, 123(13): 2140-2145.
6. **Miller DA, Chollett JA and Goodwin TM (1997):** Clinical risk factors for placenta previa-placenta accreta. *Am. J. Obstet. Gynecol.*, 177: 210-214.
7. **ACOG (2002):** Committee on obstetric practice. *Int. J. Obstet. Gynecol.*, 77: 77-78.
8. **Tanimura K, Yamasaki Y, Ebina Y, Deguchi M, Ueno Y, Kitajima K and Yamada H (2015):** Prediction of adherent placenta in pregnancy with placenta previa using ultrasonography and magnetic resonance imaging. *Eur. J. Obstet. Gynecol. Reprod. Biol.*, 187: 41-44.
9. **ACOG Committee Opinion (2012):** Placenta accreta. *Obstet. Gynecol.*, 529: 1-5.
10. **O'Brien JM, Barton JR and Donaldson ES (1996):** *Obstetrics: the management of placenta percreta:*

conservative and operative strategies. Am. J. Obstet. Gynecol., 175: 1632-1638.

11. Abuhamad A (2013): Morbidly adherent placenta. Semin Perinatol., 37: 359-364.

12. Jacques SM, Qureshi F, Trent VS and Ramirez NC (1996): Placenta accreta: mild cases diagnosed by placental examination. Int. J. Gynecol. Pathol., 151:28-33.

13. Jauniaux E and Jurkovic D (2012): Placenta accreta: pathogenesis of a 20th century iatrogenic uterine disease. Placenta, 33: 244-251.

14. Sumigama S, Sugiyama C, Kotani T, Hayakawa H, Inoue A, Mano Y, Tsuda H, Furuhashi M, Yamamoto O, Kinoshita Y, Okamoto T, Nakamura H, Matsusawa K, Sakakibara K, Oguchi H, Kawai M, Shimoyama Y, Tamakoshi K and Kikkawa F (2014): Uterine sutures at prior caesarean section and placenta accreta in subsequent pregnancy: a case-control study. BJOG., 121:866-874.

15. Khong TY, Healy DL and McCloud PI (1991): Pregnancies complicated by abnormally adherent placenta and sex ratio at birth. BMJ., 302: 625-626.

16. Comstock CH (2005): Antenatal diagnosis of placenta accreta: a review. Ultrasound Obstet. Gynecol., 26: 89-96.

17. Lam G, Kuller J and McMahon M (2002): Use of magnetic resonance imaging and ultrasound in the antenatal diagnosis of placenta accreta. J. Soc. Gynecol. Investig., 9: 37-40.

18. Oyelese Y and Smulian J (2006): Placenta previa, placenta accreta and vasa previa. Obstet. Gynecol., 107: 927-941.

19. Kayem G, Davy C, Goffinet F, Thomas C, Clement D and Cabrol D (2004): Conservative vs extirpative management in cases of placenta accreta. Obstet. Gynecol., 104: 531-536.

20. Chiang YC, Shih JC and Lee CN (2006): Septic shock after conservative management for placenta accreta. Taiwanese J. Obstet. Gynecol., 45 (1): 64-66.

21. Wu S, Kocherginsky M and Hibbard J (2005): Abnormal placentation: Twenty-year analysis. Am. J. Obstet. Gynecol., 192: 1458-1461.

22. Stafford I, Dildy GA, Clark SL and Belfort MA (2008): Visually estimated and calculated blood loss in vaginal and cesarean delivery. Am. J. Obstet. Gynecol., 199(5): 1-7.

23. Eller AG, Bennett MA, Sharshiner M, Masheter C, Soisson AP, Dodson M and Silver RM (2011): Maternal morbidity in cases of placenta accreta managed by a multidisciplinary care team compared with standard obstetric care. Obstet. Gynecol., 117: 331-337.

24. No GTG (2011): Placenta praevia, placenta praevia accreta and vasa praevia: diagnosis and management. RCOG eds. London, pp:1-26.

25. Kong X, Kong Y, Yan J, Hu JJ, Wang FF, Zhang L (2017): On opportunity for emergency cesarean hysterectomy and pregnancy outcomes of patients with placenta accreta. Medicine (Baltimore), 96(39): 7930-7939.

26. Asıcıoglu O, Şahbaz A, Güngördeük K, Yıldırım G, Asıcıoglu BB and Ülker V (2014): Maternal and perinatal outcomes in women with placenta praevia and accreta in teaching hospitals in Western Turkey. Journal of Obstetrics and Gynaecology, 34(6): 462-466.